Heat and Changes in Matter

3-4 The student will demonstrate an understanding of the changes in matter that are caused by heat.

3.4.1 Classify different forms of matter (including solids, liquids, and gases) according to their observable and measurable properties.
Taxonomy level: 2.3-A, B Understand Factual and Conceptual Knowledge

Previous/Future knowledge: In 2nd grade (2-4.1), students were introduced to the concept of liquids and solids and their properties. Students have not been introduced to the properties of gases in previous grades. Students will compare the physical properties of the states of matter in 5th grade (5-4.2).

It is essential for students to know that matter is anything that has mass and takes up space.

Mass
- *Mass* is how much matter is in an object.
- Mass can be measured using a *balance* with known masses compared to the unknown mass being measured.
- An object with a large mass feels heavier than an object with a smaller mass.

Volume
- *Volume* is the amount of space an object takes up.
- Volume of a liquid can be measured with a beaker, graduated cylinder or graduated syringe.
- An object that takes up more space has a greater volume.

Properties of matter are characteristics that can be used to describe matter.

Observable (*using senses*) properties	**Measurable *(using tools)* properties**
(Using sense of sight): color, size, shape, shininess or luster *(Using sense of touch)*: texture or relative hotness or coldness *(Using sense of smell):* odor present or not	*(Using balance)*: mass *(Using graduated cylinder or syringe, or beaker)*: volume *(Using thermometer)*: temperature *(Using ruler): length*

Matter is classified into the following forms based on observable and measurable properties:

- *Solids* have a definite size and shape, that is, the size and shape do not change.
- *Liquids* have a definite volume, but they take the shape of their containers.
- *Gases* do not have a definite shape or volume. Gases take the shape and size of their container.

It is not essential for students to calculate the volume of a solid object or the volume of a gas.

Assessment Guidelines:
The objective of this indicator is to *classify* solids, liquids, and gases according to their observable and measurable properties; therefore, the primary focus of assessment should be to group materials into categories of solids, liquids, or gases based on their observable and measurable properties. However, appropriate assessments should also require students to *infer* from information about materials with their properties described, whether the materials are

solids, liquids, or gases; *compare* various materials to determine which are solids, liquids, or gases; *identify* a material with properties described as a solid, liquid, or gas; or *summarize* the properties of solids, liquids, and gases.